

FLYMASTER AVIONICS[®]



B1 NAV User manual

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Warning

It is the sole responsibility of the pilot to operate the aircraft in a safe manner, maintain full surveillance of all flying conditions at all times, and not become distracted by the Flymaster B1nav. Flymaster Avionics is not responsible for any damages resulting from incorrect or no data provided by the Flymaster B1 NAV. Flight safety is the sole responsibility of the pilot.

It is unsafe to operate the Flymaster B1 NAV while in the air. Failure by the pilot equipped with a Flymaster B1 NAV to pay full attention to the aircraft and flying conditions while flying could result in accident with property damage and/or personal injury.



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1. Introduction

Thank you for choosing FLYMASTER B1nav. If you have any questions or comments regarding the use of our vario you can visit our website or contact our Support Department (support@flymaster-avionics.com).

This manual covers Firmware versions up to 1.21j. If have a more recent version of firmware some of the features may not be covered.

1.1. Getting started

Fully charge battery before using FLYMASTER B1nav for the first time.

The battery may be charged by either connecting the B1nav's USB connector to the wall socket charger or USB cable. B1nav's connector can be found on the right side of the B1nav (see figure:1).



Battery charger connection (figure:1)

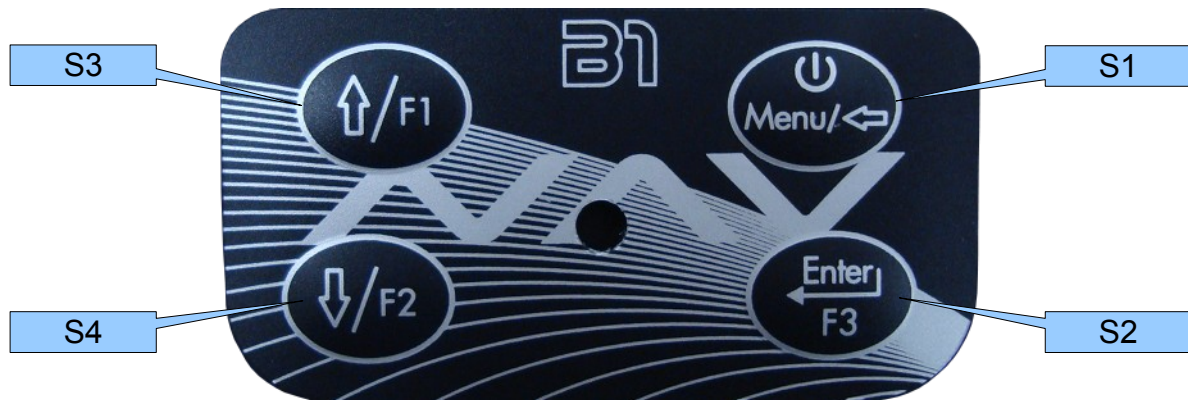
Please note that charging the battery using the wall socket charger is much faster using a PC and respective USB cable, During the charging process the B1nav display “Quick Charge” when connected to the wall socket charger and “Slow Charge” if connected to the PC USB cable.



In “Quick charge” the battery should fully charge within approximately 3 hours, whilst in “Slow charge” it may take up to 15 hours. Once the battery is fully charged the B1nav will display “Complete” and stop charging.

B1nav uses a Lithium-ion polymer battery, which is not prone to “memory effect”, Therefore the battery does not need to be totally discharged before recharging. In fact, in order to avoid battery degradation total battery discharge should be avoided.

1.2. B1 NAV Keys



B1nav keyboard (figure:2)

Four keys are used to interact with B1nav (see figure:2). Each key has 2 functions depending on whether the device is in *flight mode* or in *menu mode*. Additionally the S1 key is used to “power-up” the B1 NAV when it is switched off.

In the *flight mode* Keys S2, S3 and S4 have user configurable functions F1, F2 and F3 that can allocated in the Menu->Settings->FS Keys. In *menu mode* all keys have fixed functions represent by a symbol on the key.

1.3. Switching B1 NAV On and Off

To switch on the B1 NAV, briefly push the S1 key, this will display the start up screen with a 10 second countdown . Pushing the S2 (Enter key) before the 10 seconds have elapsed will initiate the B1 NAV On startup the B1 NAV will initiate in flight mode. If the S2 key is not pushed the B1 NAV will go back to sleep.

To switch off the B1 NAV, push the S1(menu key) to activate menu mode, using the arrow keys (S3 or S4) scroll the cursor to the “Shutdown” item and push the S2(Enter Key).

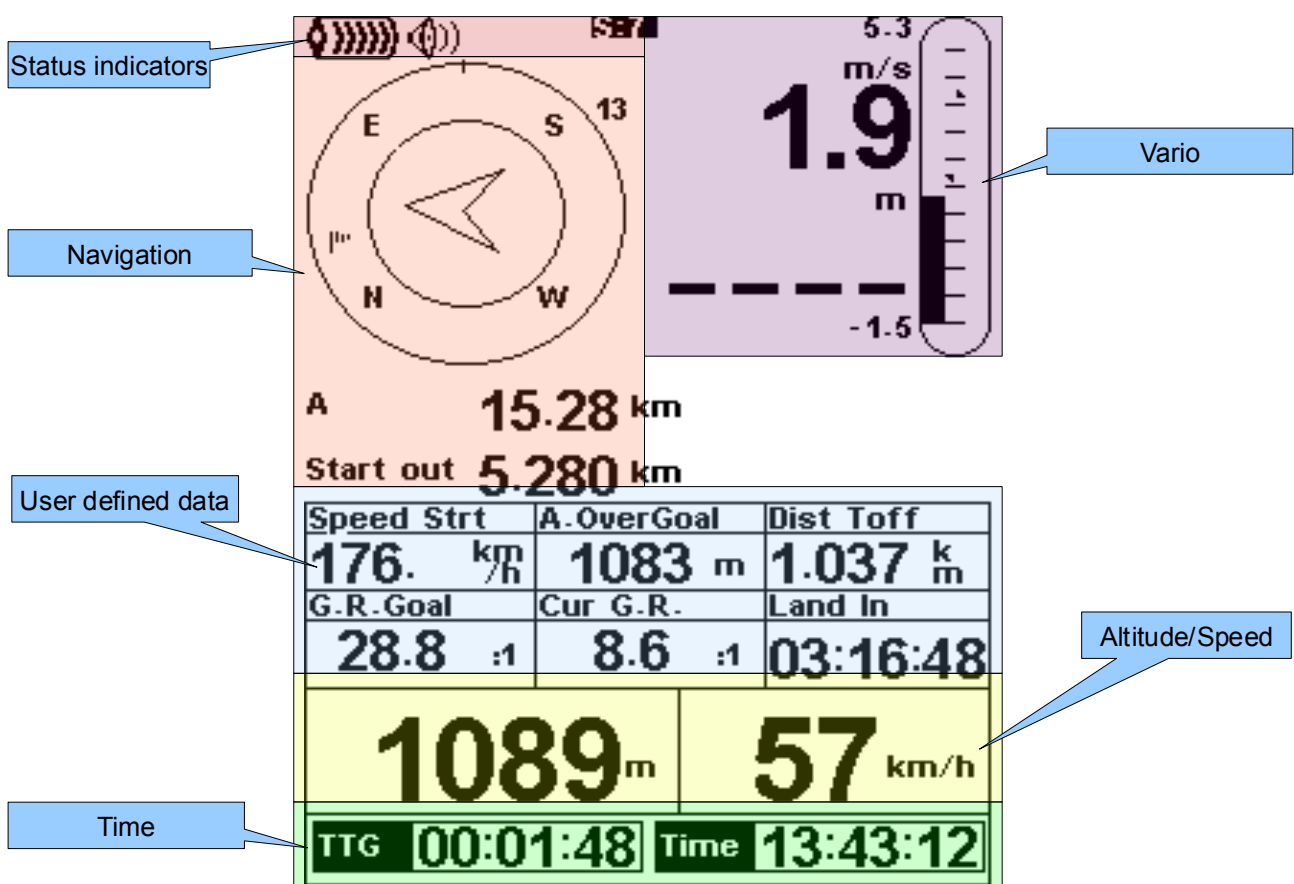


2. The *Flight Mode* Screen

The B1 NAV has a high resolution (320x240) and contrast display. This allows it to show more useful information simultaneously.

In order to increase the usability of the device some of the information is dynamic. This means the information can change according to the situation of flight. For example, if a route is active and contains a start gate, the “Duration” field shows the “Time to Go” up to the point of start opening, after which it will show the duration of the flight.

The flight mode screen is divided into several areas called “sections”, see figure below:



Flight mode screen (figure:3)

2.1. *Status indicators Section*

In flight mode at the top of the FLYMASTER B1 NAV screen, 3 symbols are visible reporting the hardware status.

The 3 symbols from left to right are the Battery Level Indicator, Sound Level Indicator and Satellite Lock Status.



- **Battery Level Indicator**

This symbol shows the status of the battery or charging indication.

Symbol	Description
	<ul style="list-style-type: none">• Battery level above 85%
	<ul style="list-style-type: none">• Battery level between 65% and 85%
	<ul style="list-style-type: none">• Battery level between 45% and 65%
	<ul style="list-style-type: none">• Battery level between 15% and 45%
	<ul style="list-style-type: none">• Battery level between 5% and 15%
	<ul style="list-style-type: none">• Less than 5% battery remaining
	<ul style="list-style-type: none">• Battery is charging.
	<ul style="list-style-type: none">• Battery not charging. This may be because of excess heat, the B1nav's internal charge circuit will not charge the battery when the battery temperature exceeds a 45°C. Wait a while of try moving the B1nav to a cooler location. If this status persists in may indicate a problem with the battery.

- **Sound Level Indicator**

This symbol indicates the currently selected sound level (i.e. volume).

Symbol	Description
	<ul style="list-style-type: none">• Sound Level 3 (maximum sound level)
	<ul style="list-style-type: none">• Sound Level 2
	<ul style="list-style-type: none">• Sound Level 1
	<ul style="list-style-type: none">• Sound is muted (No sound)



- **Satellite Lock Status**

This indicator shows the number of satellites in use for calculating the current position. When a 3D position can be obtained, usually when the GPS locks onto more than 5 satellites, the indicator becomes highlighted.

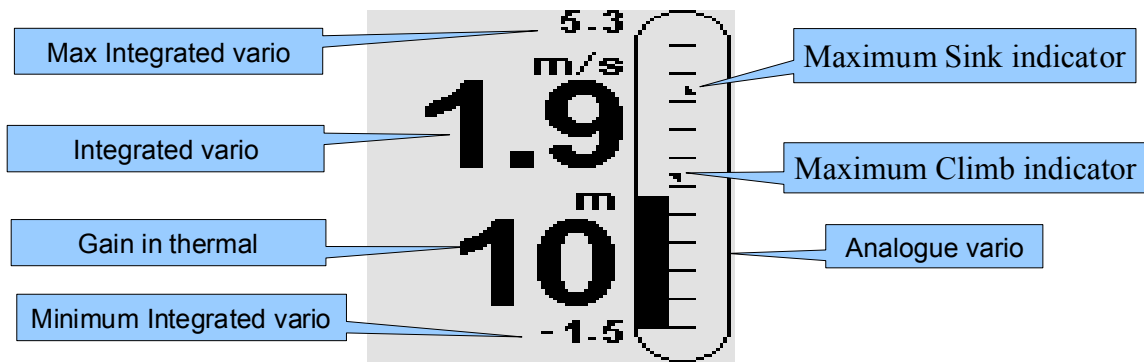
As a general rule the more satellites that are locked the more accurate the navigation solution. Note that FAI rules require 3D tracklog data, which includes GPS altitude, therefore the B1 NAV will only start recording a tracklog when a 3d fix is obtained.

The B1 NAV has very powerful 50 channel GPS receiver which offers unmatched tracking performance in harsh signal environments (-160 dBm sensitivity), and very short acquisition times. A differentiating factor of the B1 NAV is the 4 Hz GPS update rate (others only provide 1Hz) which allows the B1 NAV pilot to see very small speed and position changes. Furthermore, the movement of the position arrow is smoother and any position change is shown in 1/4 of the time of other devices. (4 Hz update rate requires more than 5 satellites in view).

More information about GPS accuracy and also other GPS related information can be seen in (<http://www.kowoma.de/en/gps/errors.htm>).

2.2. Variometer Section

The variometer section contains information about the rate of climb, it is comprised of an analogue "instant" vertical speed indicator known as the Analogue vario and several digital indicators providing information about averaged rates of climb.



Variometer Section (figure:4)

- **Analogue vario**

The Analogue vario bar is scaled from 0 m/s to +/-10 m/s depending if you are climbing or sinking.

When the B1 NAV detects that the pilot is climbing, a black bar starts to grow from the bottom of the scale to the top, and for each increase of 0,1 m/s the bar height graph will increase to the maximum of +10m/s.



If a sink is detected the Bar will increase from the top of the scale to the bottom and will increase for each 0,1m/s to a maximum of -10m/s.

The B1 NAV additionally graphically shows the values of maximum vario analog sink and climb encountered during the flight. This information are represented by two small arrows, the maximum analog vario climb is represented by a small arrow pointing up, inversely the arrow pointing down represents the maximum sink.

- **Integrated vario**

This indicator displays the averaged rate of climb during the last X seconds. The factory default for X is 10 seconds, but can be adjusted in the settings (see item 8.2. on page 32). The resolution of the digital vario is 0.10 m/s and the full scale is reached at ± 99.9 m/s.

The integrated vario is particularly useful in determining the actual strength of a bumpy thermal.

- **Maximum and Minimum Integrated vario**

Once a flight has started these indicators show the maximum and minimum thermal strength encountered during the flight. Note that these values are using the integrated vario not the instantaneous rate of climb, so they offer a good indication of the quality of the day's thermals. When the B1 NAV is switched off these values are reset back to zero.

- **Gain in thermal**

The B1 NAV considers a thermal has been entered when the *Integrated vario* value goes above 0.5m/s and considers the thermal is exited *integrated vario* goes bellow -1.0 m/s. Once in the thermal the Gain indicator will keep track of the maximum altitude reached in the thermal. If the altitude is less than the the max thermal altitude then a negative number will show the difference from the highest point reached. If the altitude is equal or higher than the maximum reached then a positive number will show the altitude gained since entering the thermal.

The thermal gain indicator is particularly useful in measuring the performance of a thermal. Typically a thermal may have slow point (inversions) the unique gain indicator keeps track of how much altitude is being gained in the thermal. When the pilot enters the thermal B1 NAV will reset the Gain indicator to 0 and will start to track how much altitude the pilot has gained. At a certain point in the thermal the lift may become weaker and inconsistent. At this point the gain indicator will show altitude loss in this inconsistency. Once the pilot cores the thermal correctly again the indicator will show the gain since thermal start.

2.3. Time Section

The *Time Section* contains 2 fields, the actual local time and an elapsed time or time remaining. These fields are represented in Hour:Minute:Second format.



All the internal B1 NAV time calculations are based on UTC (Coordinated Universal Time). This is also the time saved on the track-log. However, the time displayed in the time field is calculated adding an UTC offset to the UTC time obtained from the GPS receiver. The “UTC offset” should be defined in the settings menu (see item 8.2. on page 32) so that the correct local time is displayed.

The second time field is dynamic and will vary according to the current flight status and type of task defined. It will show TTG (time to go) before start gate opening, and will then change to “Dur” (duration) which is the time elapsed since the opening of the start. If no start gates are defined in the task or no task is defined then this field will show “Dur” which in this case is the time elapsed since takeoff. The takeoff is event is triggered when ground speed exceeds 10km/h and a 3d fix is available.

2.4. Altimeter and Speed

- **Altitude**

The “altitude” field (see Figure 6) indicates the absolute height in meters or feet depending on the setting. This altitude corresponds to the barometric altitude and thus depends totally on the QNH (absolute pressure at a given moment and location in regards to the correspondent pressure at MSL).

The altimeter cannot be reset, but can be set using the corresponding menu option (see item 8.1. on page 31).

- **Speed**

The “speed” field indicates the speed over ground in km/h. The speed is only available when the GPS receiver has a valid signal.

2.5. User Defined Data Section

The B1 NAV has 6 user defined fields which the pilot can configure for his own needs (see item 8.7. on page 38).

The following table lists and explains the available data fields, as the B1nav firmware evolves this list will likely grow.



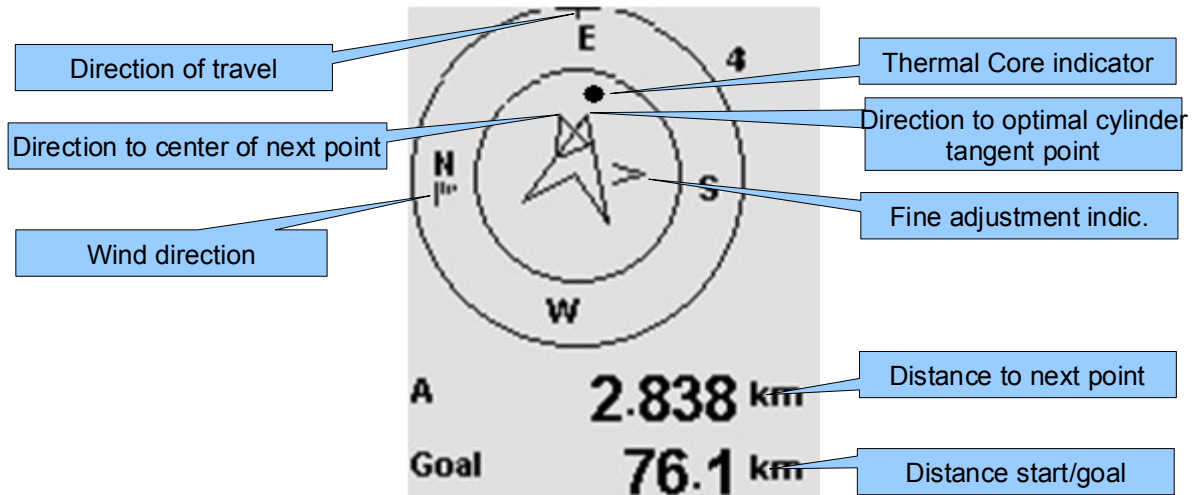
Field ID	Description
VMG	Velocity made good, is the speed at which the pilot is approaching the active turn point.
Dist Toff	Distance to take off. The direct distance to the point of take off.
Dist Start	Distance to start. The distance to the start cylinder line.
Dist.Goal	Distance to goal. From the current position and flying through all pending turnpoints.
Speed Strt	Speed to Start. The speed at which the pilot must fly in order to reach the start gate at its opening.
G.R.Goal	Glide ratio to goal. Indicates the glide ratio (finesse) from the current position and altitude to the Goal going through the remaining turn points.
Cur G.R.	Current glide ratio. This glide ratio is calculated from the integrated vario over the current ground speed.
G.R.M.G	Glide ratio made good. The actual glide ratio towards the active turn point. It is calculated using the integrated vario over the VMG.
A.OverGoal	Altitude over goal, is the difference in altitude from the current altitude to the goal's altitude. Based on barometric altitude.
Max.Alti	Maximum altitude of reached during current flight. This is based on barometric altitude.
GPS Alti	Altitude reported by the GPS.
Alt Gain	Altitude gained in current thermal.
Land in	During competitions tasks it is common, usually due to safety reasons to have a "land by" time. The land by time is defined by adding a waypoint typically the goal to the already defined task, setting it as "Landing" and defining the time. "Land in" shows the amount of time remaining before having to be on the ground.
Goal close	The time remaining to goal close time.
Altitude2	Second Altimeter which can be set independently of the main altimeter.
Vario	Numeric value of the instant Vario value.
Arrival Next	Estimated arrival height above to next waypoint. The height is calculated considering the average glide ratio the pilot has been making.
Arrival Goal	Estimated arrival height above the Goal. The height is calculated considering the average glide ratio through each of the remaining task legs. This means that wind, day quality and glider performance is integrated into calculation.
Dist. Edge	Distance to the optimal tangent point of next waypoint. (see section 2.6)
Above Toff	Altitude above takeoff, this field is automatically calculated since the B1nav remembers the takeoff altitude when it sees the pilot launch.



<i>Field ID</i>	<i>Description</i>
G.R.Toff	Glide ratio to takeoff, usefull to know if you want to top-land.
Dist.Thermal	Distance to last thermal core.
Heading	Pilots heading in degrees.
Ave.Speed	Average speed, uses a filter to show a smoother speed number, eliminating erratic speed jumps due to glider pitching.
Wind Speed	Calculated wind speed using drift calculations. This figure is also shown next to the "Navigation wheel".



2.6. Navigation Section



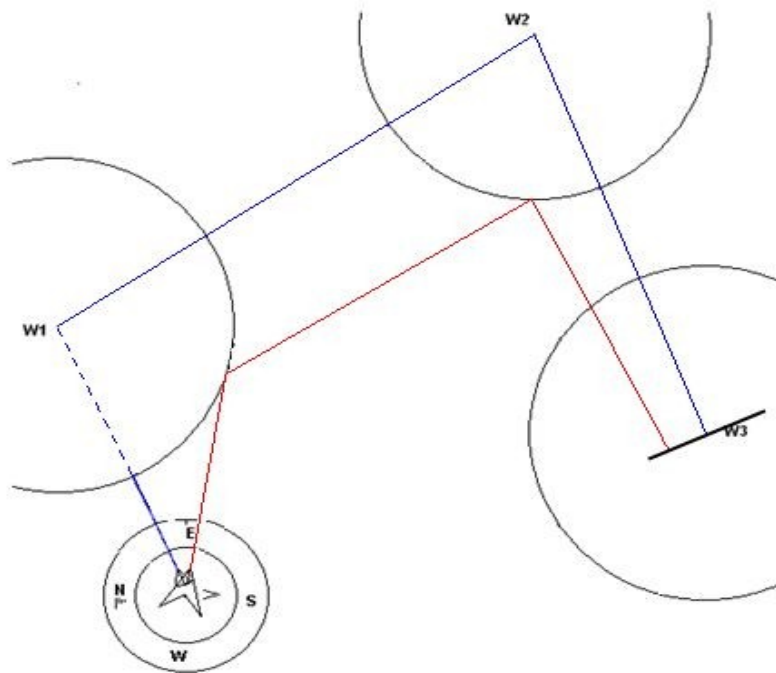
Navigation section (figure:5)

This is B1 NAV main navigation information section. It shows graphically which direction to navigate, the actual travel direction, wind direction, next waypoint, start gate/goal distances and thermal core map.

For information to be displayed in the navigation section the B1 NAV must have a valid GPS fix. When no valid fix is available the direction arrow will not be shown and the distance indicators will show "-----".

When a route is active the "direction of next point" arrow (bigger one) will point to the optimal cylinder tangent point. If no route is defined it will start showing the direction to the takeoff after the takeoff is detected, i.e. the average speed exceeds 5km/h. During a competition task flight using the optimal tangent navigation saves a substantial amount of time. The smaller arrow points to the center of next waypoint cylinder, the combination of both arrows provides a spatial location of the turnpoint.

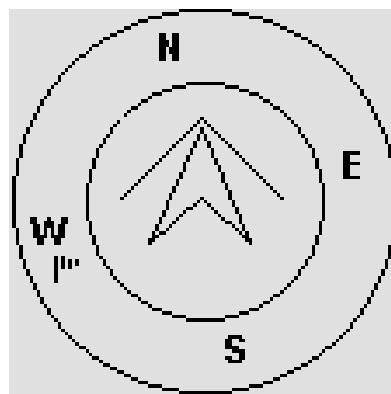
The example below shows a hypothetical task. A pilot using navigation to the center of the turnpoints will probably be flying the blue course, whilst a pilot using the optimized route will fly the substantially shorter red route.



Navigation wheel (figure:6)

As the correct course approaches it becomes difficult to understand which is the perfect direction, so B1 NAV shows a “fine adjustment indicator” in the form of a small arrow. An arrow to the left means the pilot should turn slightly to the left, and inversely an arrow to the right indicates a small adjustment to the right is needed.

When the course is perfect, i.e. less than 1° off, B1 NAV indicates this by showing a large arrow forward, see figure:7 below.



Perfect heading (figure:7)

The 2 fields below the navigation wheel show the distance to go for next active turn point and a dynamic field showing either the distance to the start gate or the distance remaining to the goal depending on whether the start has been validated or not.



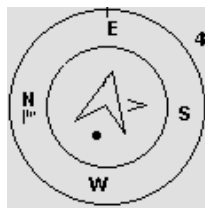
A start is automatically validated when a pilot correctly completes the start, until the start is completed B1 NAV will not advance to the next point in the route. Another important aspect of the start is B1 NAV does not point to the start cylinder but rather to the next turn point on the list.

The distance to start will become highlighted when the pilot is in an irregular position, i.e. inside a start cylinder where he should be out or vice-versa.

•Thermal Core Map

Another useful feature of the B1-NAV is the thermal core map. During a thermal climb the B1-NAV keeps track of the strongest climb values point for each 50m layer. The point of strongest lift is then graphically represented by a black ball on the Navigation Wheel, showing where the thermal core is relative to the pilot's position. The position of the ball (thermal core) is constantly updated as the pilot moves. When the pilot is over 140m from the thermal core the ball will be at the edge of the circle, as he moves closer it will move towards the center.

In the image below (figure:8) the thermal core is currently behind the pilot at a distance of approximately 80 meters.



Thermal core map(figure 8)



3. Menu mode

When in the *flight mode* screen, pushing the **menu(S1)** button accesses the *menu mode* screen. When in the menu pushing the **menu(S1)** button will go back to *flight mode*.

MENU
Waypoints/Task
Task Delay
Task Navigator
Near Airfields
Flight Log
GPS
Settings
Shutdown

Main menu (figure:9)

To access the different items on the menu use the **arrow up(S3)** and **arrow down(S4)** buttons. Once a menu item is selected pushing the **enter(S2)** executes the selected function.

Menu item	Description
Waypoints/Task	Accesses B1 NAV's waypoints and task definitions. (see item 4. on page 20)
Task delay	Shifts all time data in the active task.
Task Navigator	Allows manual override of navigation.
Near Airfields	Displays airfields page, dynamically shows the glide ratios and distances to the nearest landing fields, sorted by easiest glide.
Flight log	Accesses the stored flights list.
GPS	Displays detailed GPS status and allows GPS module reset. (see item 7. on page 30)
Settings	Accesses the Settings sub menu. (see item 8. on page 31)
Shutdown	Switches off the B1 NAV, and displays detailed battery status.



- **Task Delay**

During competitions it is common practice due to weather conditions to postpone a task. Generally take off is postponed and so is the start gate, goal close and land by times. Instead of having to edit the defined task B1 NAV offers a task delay feature which moves all defined times in a task forward by X minutes. To delay a task in the menu simply push the enter(S2) key on the Task delay option, using the arrow keys (S3 and S4) select the number of minutes to delay by and push the enter(S2) key. To exit the “Task delay” function without changing task times push the menu(7) key.

- **Task Navigator**

This function is useful to override the automatic task navigation provided by the B1nav, and should only be used if for some reason a mistake was made during the creation of the task. When selecting it the B1nav will display a list of the waypoints in the task, note that starts will be grayed since it is not possible to navigate to a start. Clicking the menu will get you back to the flight screen without any change to the navigation.

Note that an override to the navigation will immediately open any pending start, in other words the start will be considered as done.



4. Waypoints and Task

The Waypoints/Task page manages the waypoints and task definition in the B1 NAV.

Waypoints	Task	km
B01	B01	
B02	B02	start
B03	B02	16.6
	B03	23.2
		39.9

Waypoint list

Task

Selected item data

Name: **B01**
Altitude: **156m**
Latitude: **N 40°54.076'**
Longitude: **W 008°29.141'**

Waypoints/Task page (figure:10)

The page is divided into 3 areas, the waypoint list, task and selected item data. On entering the page the cursor is active on the waypoint list, and the selected item data will show details about the selected waypoint. As the cursor is moved to a different waypoint so the selected item data changes as to show details of that waypoint. If no waypoints are defined the waypoint action menu is automatically opened and the only available option is the “Insert new Waypoint”.

Pushing the **enter(S2)** on the selected waypoint opens the waypoint action menu in the selected item data area (see figure 11). Pushing the **menu(S1)** goes back to the main menu.



4.1. Waypoint action menu

Waypoints	Task	km
B01	B01	
B02	B02	start
B03	B02	16.6
	B03	23.2
		39.9

Add WP to Task
Insert New WP
Edit WP
Delete WP
Delete All Waypoints
Edit Task

Waypoint action menu (figure:11)

On entering the waypoint action menu the selected waypoint becomes grayed indicating that waypoint specific actions will be carried out over the respective waypoint.

Action	Description
Add WP to Task	Adds the selected waypoint to the end of the task.
Insert New WP	Starts a new waypoint entry. The current location is automatically used for default waypoint data.
Edit WP	Start editing the selected waypoint.
Delete WP	Delete the selected waypoint. If the waypoint is being used in the task this option is disabled.
Delete all waypoints	Deletes all waypoints and task.
Edit Task	Starts editing task. If no waypoints have been added to the task this option is disabled. (see item 4.2. on page 21)

4.2. Edit task(route)

In the Waypoint action menu selecting the “Edit Task” option will activate the Task edit. The cursor will highlight the on the task item, know as a *Route point* (see figure 12).

Warning: After the task is edited navigation will be restarted at the beginning of the route.



Waypoints	Task	km
B01	E01	
B02		
B03		
B04		
		0.0

Type: Cylinder
Size: 000.400km

Edit task (figure:12)

In the “Selected item data” information about the Task turn-point is displayed, the example above shows the B01 task turn-point configured as a Cylinder with a 400meter radius.

In the above example the task has only one turn point and is thus considered to be a “go to” type route. The B1 NAV will automatically start navigating to that point.

When the task contains more that one point then the first turn point will automatically be assumed as the take-off point, therefore is ignored in navigation and is only used for calculating the total task length.

Each route point in the task is defined having a particular type, the table below explains the different types and how they are handled by the B1 NAV.

Type	Navigation
Take off	This route point type must be the first one in the sequence of points. It is only a place marker, for calculating the entire task length. B1nav will ignore it for navigation purposes.
Cylinder	This is the most common route point type. The cylinder type is defined by a coordinate and a radius. The coordinate is taken from chosen waypoint and the radius can be defined by the user. By default the B1nav will add route points with a 400m radius since this is the FAI standard. During navigation B1 NAV will only advance to the next route point once the user enters it.
Start In	Start In route points are start gates, sometimes also known as “Exit start”. B1 NAV will only validate the point and advance to the next point on the route if the user is inside the set radius at a latter time than the one defined. Note that the sequence in which this point



	appears in the task list in very important.
Start Out	Start Out is the most commonly used start gate, sometimes also known as an “Enter start”. B1 NAV will only validate this point and advance to the next point when the user is outside the radius at a latter time that the one defined. Note that the sequence in which this point appears in the task list in very important.
Goal Cylinder	The goal cylinder is very similar to the Cylinder, expect for the fact that it has a “Closing Time”. The closing time is used to calculate the Goal Close user defined field.
Goal Line	A goal line is defined as a line, with a specific length and centered in a the route point. By definition the line is perpendicular to the direction from the previous turn point to it. Due to safety is common to have competition tasks that include a Goal Cylinder used for measuring time (end of speed section) followed by a line which must be crossed. In this type of task the Goal route point is inserted twice, and then set as a Goal Cylinder and Goal Line respectively.
Landing	Most of the times landing can take place at the Goal, in this case the Goal waypoint may be inserted again. Doing so allows a Landing limit time to be inserted which B1 NAV uses to calculate the “Land In” data field. On some occasions, for safety reasons, landing is recommended to be elsewhere, so a different waypoint may be used.

As the B1 NAV validates a turn point it emits a audible notice informing the user that navigation has now changed.

- **Edit route point**

Added route points are automatically set as cylinders with a 400m radius, (except for the first one as mentioned above which is set as takeoff). To modify a route point push the enter(S2) button which will display the route point configuration menu, selecting “Edit Route Point” will start editing the route point attributes (see figure 13).

Type: **Goal line**
Size: **000.400km**
Time: **00:00:00**

Route point edit (figure: 13)

Each route point has an associated type, which can be takeoff (automatically assumed to be the first one), *cylinder*, *start-out*, *start-in*, *goal cylinder*, *goal line* and *landing*. Should a route point require to simultaneously more that one type, for example a turn point which is also a start gate point, it should be added again for each required type.



Very important: The sequence in which the route points are listed is very important since B1 NAV will navigate them in that order, so in the case of a start gate which is also a turn point (as is commonly used in competition tasks) the start **must** be placed before the turn point.

The “Time” is only available on turn point types that are time related, thus the “Time” will only be visible when the turn point type requires a time. The table below shows field types and their associated time field meaning. The time field is represented in local time.

<i>Turn point Type</i>	<i>Time field usage</i>
Take off	No time field.
Cylinder	No time field.
Start out Start in	The time at which the start opens. The start is only validated if the pilot is in a regular position (in or out) later than the defined time. The TTG (time to go) will show how much time remains to the opening of the start, i.e the difference between this field's value and the local time of day. Navigation to next point will only continue after the validation of the start.
Goal Cylinder Goal Line	Time of goal close. The time it will be used by the “Goal Close” configurable data field displaying how much time is left until the close of the goal.
Landing	Time of compulsory landing. The time will be used to calculate the “Land In” user defined field.

- **Move Route Point**

The sequence of a route point in a route may be easily changed. To change the position of a route point simply select the route point using the arrows (S3 and S4), push the enter(S2) button to activate the route point configuration menu then select the Move Route Point option and push enter(S2) button. The move indicator will be shown next to the selected route point, using the arrow buttons (S3,S4) moves the route point within the route and pushing the the enter(S2) ends the move function.

- **Remove Route Point**

To remove a route point from the route, select the point using the arrows (S3 and S4), push the enter(S2) button to activate the route point configuration menu. Then select the “Remove Route Point” option from the menu and push the enter(S2). The point will be removed.

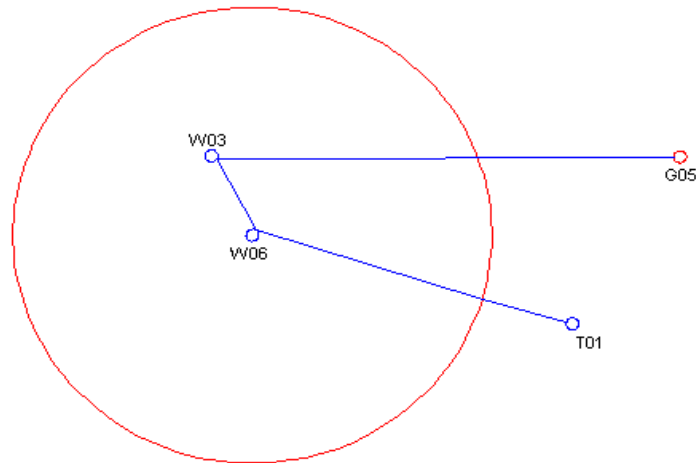
- **Delete Route**

Delete route will delete the entire route. On any route point push enter(S2) button to activate the route point configuration menu. Select the “Delete Route” option from the menu and push the enter(S2) button. The route will be deleted and the cursor will be returned to the Waypoint list since no task now exists for editing.



4.3. Example of a task and how to set it up on the B1nav:

- Example 1



In the above example, the defined task is has it's takeoff set at point "T01" with the first turn point defined at "W06", followed by "W03" and finally the goal at "G05" which is a cylinder type goal with a 400m radius. The goal closes at 17:00 and the meet director defines that everyone must be landed by 17:30.

The start gate is a "start out" at 18km around W06, graphically represented above as the red circle around waypoint W06. In other words the pilot must be further than 18km from the turn point until the defined "start opening time" which for this example we will assume to be 12:30pm.

- Setting up the task

Following the instructions in section 4. access the waypoints/task page of the Flymaster B1 NAV.

To setup this task on the B1 NAV, start by deleting any existing task on the B1 NAV (see section 4.2.).

Add "T01" to the task using the "Add WP to Task" (as described in section 4.1.), B1 NAV will automatically assume it as the takeoff.

Add "W06" to the task twice, we need to add W06 twice because since it is a turn point and also a start gate.

Add W03.

And add G05 twice. We will use the second occurrence of G05 to define the landing deadline.

Next step "Edit task".



The task list will contain the following items:

T01
W06
W06
W03
G05
G05

On the task list, select first occurrence of “W06” and edit it. Change the waypoint type to “Start out”, set the distance to 18.000km and the start time to 12:30. Beware: It is very important that the first occurrence of W06 be set as the start, otherwise B1nav will assume that the turn point W06 needs to be completed before the start gate, and that is not what is required for this task.

Edit the first occurrence of the G05, and change it's waypoint type to “Goal cylinder” since the radius of goal is 400m the B1nav already assumes 400 as the default value, so only the time needs to be defined, we set it to 17:00 which is the goal close time.

Edit the second occurrence of G05 and change it's waypoint type to “Landing”, this waypoint will serve to warn us we must be on the ground before the landing deadline. So we define the time as 17:30.

We are now setup for the task, going back into the “Flight Mode Screen” automatically activates the task and starts navigation.



5. Near Airfields

The near airfields menu allows the pilot to quickly check for landing options. The function can be selected directly from the Flight Mode screen, by using a short cut function key (see 8.8. on page 38).

Only airfields below your current altitude will be displayed. To define a waypoint as an Airfield set the “Landing” as “Yes” in the waypoint edit screen (see 4.1. on page 21). Airfields are sorted by glide ratio.

A landing waypoint may be selected by using the arrow keys. Pushing the “enter” key will immediately activate navigation to the selected waypoint.

Near Airfields		
B006	12.48	9.6
B003	15.25	11.8
B004	15.68	12.1
B007	23.13	17.8

Near Airfields (figure:14)

On figure 14 the closest airfield is 12.48km from our present location, and based on our current altitude to the altitude of the airfield our glide ratio to it is 9.6 to 1.



6. Flight Log

The Flight Log option allows the user to access information about previews saved flights. In the top of the screen a list of flights is showed. Each flight is identified by the take off date and time.

Flight Log	
2010-08-28	16:20:45
2010-08-15	14:15:07
2010-08-01	19:42:46
2010-07-29	19:49:32
2010-07-29	19:02:32
2010-07-29	08:15:37
2010-05-12	03:06:24
2010-05-06	18:26:53
2010-04-30	08:47:08
2010-04-30	07:41:38

Duration: 00:56:31
Max.Speed: 50
Max.Climb: 0.9
Min.Sink: -1.7
Speed Sec: -----
Max.Alti: 1179

Flight Log (figure 15)

Flights can be chose by using S3 and S4 keys. For each flight the flowing information is displayed:

- Duration – Flight duration
- Max.Speed – Maximum Gps Speed
- Max Climb – Maximal climbing rate
- Min. Sink – Maximal sinking rate
- Speed Sec – Time between the start time and the end speed section.
- Max. Altitude – Maximum altitude during flight (ASL).

The Flight Log option also allows to delete flights saved on the B1 NAV, to do so just select the flight, press Enter and select “Yes” to confirm the permanent erase of the flight from the B1 NAV (see figure 16)



Flight Log

2010-08-28	16:20:45
2010-08-15	14:15:07
2010-08-01	19:42:46
2010-07-29	19:49:32
2010-07-29	19:02:32
2010-07-29	08:15:37
2010-05-12	03:06:24
2010-05-06	18:26:53
2010-04-30	08:47:08
2010-04-30	07:41:38

Delete flight

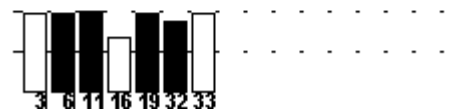
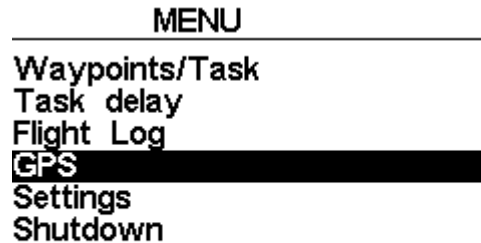
Are you sure: **No**

Delete flight(figure 16)



7. GPS status

In the main menu the B1 NAV provides a detailed view of the GPS status.



Satellite status (figure:17)

Figure 17 illustrates the GPS satellite reception page, in the example B1nav shows 7 satellites are visible, and 4 are being used to provide the position fix. Each bar shows the signal strength for each individual satellite. A filled bar indicates B1 NAV has a “lock” on that satellite.

If B1nav is switched on in a location where no satellites are visible (indoors for example) it will go into wide search mode. If this occurs going outdoors again will make B1 NAV take an abnormal amount of time to pick up satellite signals. Should this occur pushing “enter” on the GPS menu item will reveal the “Reset GPS” option, changing it to yes will make B1 NAV reset the GPS status and start a new search. So if you notice B1 NAV is taking abnormally long to get a fix (over 2 minutes) a “gps reset” will probably get it locked quicker.



8. Settings menu

The settings menu is used to configure B1 NAV's many features. The menu is divided into two sections, the menu option and the associated configurable fields. To use the configuration menu, select the desired option by using the arrow keys (S3 and S4) then push the enter(S2) key to edit the fields. When accessing the fields the menu item becomes "grayed" and the respective field data item is highlighted. Using the arrow keys (S3 and S4) changes the value on each field, enter(S2) moves to the next field and menu(S1) moves to the previous field. If the enter(S2) key is pushed on the last field the all the data in the selection section is stored and control returns to the configuration menu, inversely if the menu(S1) key is pushed on the first data field the changed settings are restored and control is returned to the configuration menu.



Settings Menu(figure 18)

8.1. Set Altimeter

The set altimeter page adjusts the barometric altimeter. A barometric altimeter calculates altitude based on atmospheric pressure. Since atmospheric pressure can vary substantially along time it should be calibrated prior to takeoff.

Calibrating the altimeter can be achieved by entering the know altitude of the location. Entering an altitude automatically calculates the QNH. If the QNH is changed then the altitude is adjusted accordingly. This method allows calibrating the altimeter by either entering a know altitude at the current location or known QNH for a particular instant in time at the current location.



Altitude can also be set from the GPS, below the QNH you will find a “Get from GPS” field which can be set to “Yes” “No” or “Auto”. Adjusting this value to “Yes” will make the B1nav take the altitude from the GPS and adjust the altitude accordingly, the “Yes” is not stored in the setting, it is a one time only operation. Note that below this field and indication of “position dilution of precision” (pdop) is shown, this gives you an indication of how reliable the GPS altitude is at the moment you are setting the altimeter. The lower the pdop value the more accurate the position fix, values below 2.5 are fairly accurate.

The “Get from GPS” can also be set to “Auto”, this value is stored in the settings. When “Auto” is selected, the B1nav will automatically set the altimeter to the GPS altitude when the pdop value reaches a value of 1.8. This is only done once every flight, to “re-arm” the Auto set feature the B1nav must be switched off and back on.

QNH: **101.2894**
Get from GPS: **Auto**
pdop: not 3d
Altimeter: **75m**
Altitude2: **79m**

Set Altimeter

8.2. Time

The time page sets interval related parameters and the Universal Coordinated Time (UTC) offset.

Vario Integr.: **10s**
Trk interval: **01s**
UTC offset: **0**

Timing Parameters (figure:19)

The current firmware version supports two interval related parameters the “*Vario Integrator*” and “*Track Interval*”.

- Vario Integrator

The Integrated Vario (see Integrated vario on page 11) is calculated using the last X seconds defined by this value.

- Track interval



During flight B1 NAV will store a track log point every track interval seconds, recording a track automatically starts once a speed of 10km/h is exceeded and B1 NAV has a 3d GPS fix. However when a task is active B1 NAV will store a track log point immediately as it enters a turn point cylinder, open start or goal.

Using it's GPS B1 NAV will automatically adjust time to Universal Coordinated Time (UTC). The user should adjust the UTC offset so that the time displayed by B1nav matches the local time.

8.3. Vario Acoustics

The user can change the climbing and sinking rate sound trough the respective threshold values. These thresholds correspond to the climbing and sinking rates at which sound activates.

The user can also define in the Acoustic Thresholds option the sink alarm and the sound volume of is B1.

The sinking threshold is set to -2 m/s by default. The value can be changed by pressing the S2 key when the “Acoustic Thresholds” option is highlighted on the settings menu. This action will highlight the “Sink TH” threshold which can be changed using S3 and S4 keys to increase and decrease the value. Confirmation should be made by pressing S2 key, which at the same time highlights the “Climb TH” threshold, and same procedure can then be used to adjust the sinking threshold. The “Sink Alarm” is highlighted when the confirmation of “Climb TH” is made.

Additionally the audio frequencies can be adjusted to match the user's preference, by setting the “Base Frq” and “Increments”.

The “Base Frq” is the first frequency used to produce the initial sound which corresponds to the climb threshold, usually 0.1 m/s. Later, as the climb rate increases, a bip, bip sound is produced for which the cadence and frequency also increase. The “Base Frq” can be set between from 500 to 1500 Hz. The higher is the frequency value, the more high pitched the sound is.

The “Increments” parameter sets the frequency increment for each 0.1 m/s climb rate increase. The “increments” can be set from 1 to 99 Hz.

The preset values for “Base Frq” and “Increments” are respectively 700 Hz and 10 Hz.

In order to change the base frequency value press S2 key after “Audio Frequencies” menu option is highlighted. This action will highlight the “Base Frq” value so it can be increased using S3 key or decreased using S4 key. S2 key should then be pressed, thus confirming the “Base Frq” setting and highlighting the “Increments” option.



```
Sink TH: -2.0m/s
Climb TH: 0.1m/s
Sink Alarm: 0.0m/s
Base: 0700hz
Increments: 10hz
```

The same procedure can be used to change the “Increments”, after you chose the value for the increments, to confirm and return to Settings menu press S2.

8.4. Advanced Features

The advanced features settings option can be used to adjust the B1 NAV acoustics to the user preferences. Using these features the user can turn the vario sound more or less responsive, and can also turn on and off the buzzer functionality.

There are following four advanced features:

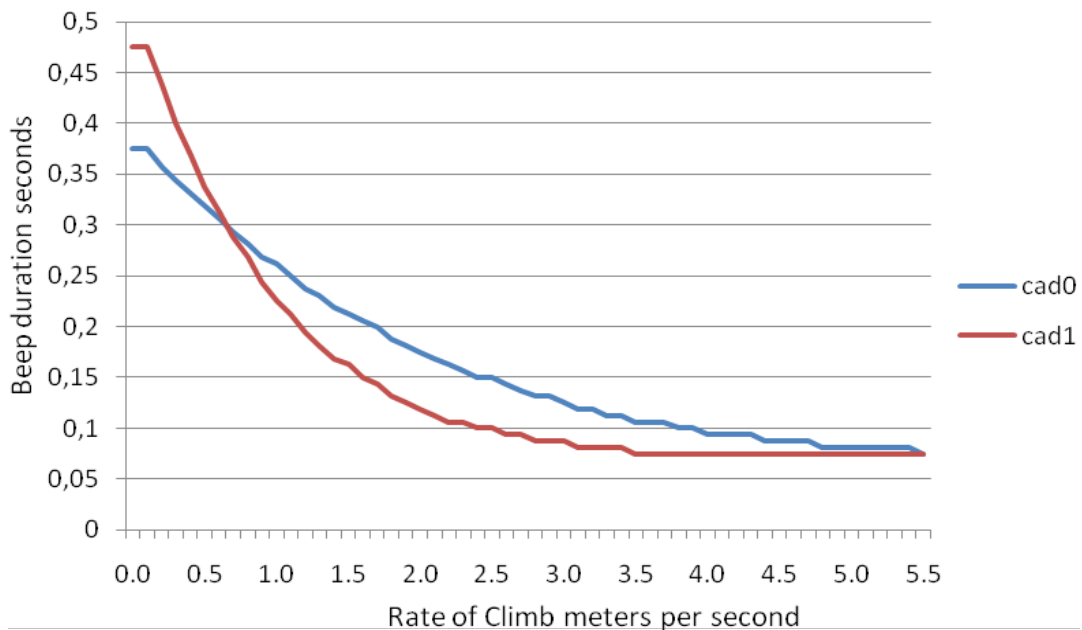
```
Damper: 08
Cadence: 1
Dynamic freq: On
Buzzer: 3
Auto Silent: On
```

- **Damper**

B1 NAV's vertical speed calculation are based on air pressure variations. It is very seldom that the air pressure is absolutely stable. Turbulence caused by wind is sufficient to cause small variations in pressure. For this reason B1 NAV filters (averages) the pressure data to prevent constantly detecting tiny pressure variations. The value that defines how much is filtered is the damper. Setting a lower damper value causes the B1 NAV to become more responsive but harsher, inversely a higher value causes B1 NAV to be less responsive but smoother. We have found that an ideal value is 8 and therefore the default value.

- **Cadence**

When a rate of climb higher than specified by Climb threshold is reached the B1 NAV creates a beeping sound. The rate (cadence) of the Beeps increases as the rate of climb increases. This increase in rate is not linear, the cadence parameter specifies which cadence curve should be used. Currently there are 2 possibilities, see the graphs below for details on cadence times for rate of climb.



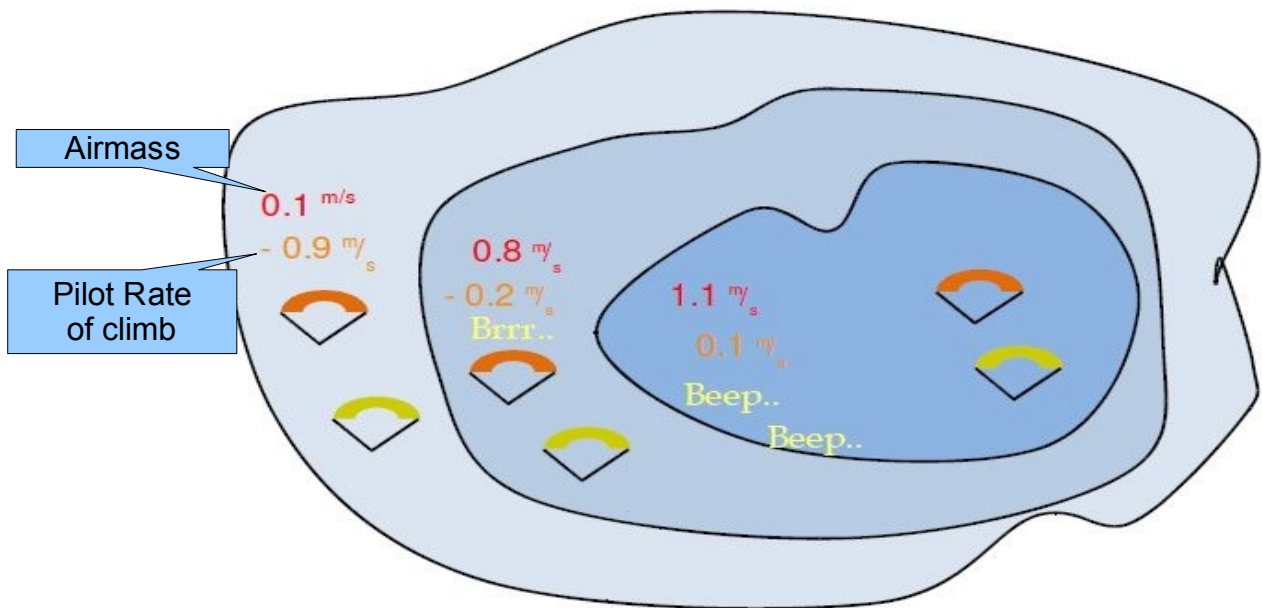
- **Dynamic Frequency**

The B1 NAV beeps at a specified pitch (frequency) when a certain rate of climb is encountered, when dynamic frequency is off the pitch (frequency) of that beep will remain constant every if the rate of climb changes. With dynamic frequency on the pitch of the beep may vary if the rate of climb varies during the individual beep.

- **Buzzer**

Is so called because of the sound it emits, which resembles a buzzing sound. This buzzing sound is emitted when the rate of climb is close to, but has not yet reached the specified Climb threshold. Although the value is set as a value between 0 and 9 each unit is considered to be 0.1 m/s, ie. 3 is 0.3m/s. Subtracting this decimal value from the climb threshold will give us the value at which the B1nav will start buzzing. For example with B1nav's default values, Climb threshold=0.1m/s and Buzzer=3 (0.3m/s) the buzzing will start at -0.2m/s because $0.1 - 0.3 = -0.2$. Also at the 0.1m/s directly below the Climb threshold B1nav will emit a constant sound varying rapidly in pitch from around 100hz to the set base frequency at which the first beep is emitted. Setting the Buzzer value to 0 will disable the buzzer feature.

Although the Buzzer will sound very annoying on the ground it becomes an amazing companion if flight allow the pilot to pick-up thermals he would have usually missed.



A practical example of the advantages of the buzzer feature can be illustrated in figure 30. In this example both pilots are sinking at -1.0 m/s. The orange paraglider has a B1 NAV for which the climbing threshold is set to 0.1 m/s and the Buzzer parameter is set to 3. The green paraglider has usual vario for which the climbing threshold is set to 0.1 m/s.

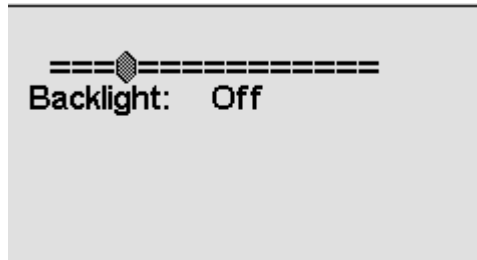
As shown in the figure, when both pilots enter the thermal nothing is heard. The air is rising at 0.1 m/s but both pilots are descending at -0.9 m/s. In the second level of the thermal the air is rising at 0.8 m/s and so pilots are descending at -0.2 m/s. At this stage the orange pilot starts to hear the Next to Climb brrrrr sound of his B1 NAV, which helps him to center the thermal, while the green pilot is still unaware of the thermal. Finally, in the 3 level the air is rising at 1.2 m/s and so both pilots climb at 0.2 m/s. The B1 NAV pilot starts to hear his vario beep... beep... sound, it is only at this point the green pilot hears the first beep from his instrument.

- **Auto Silent**

Setting Auto silent on will keep the B1 NAV's buzzer quiet until a "start flight" has been detected. A start flight is detected when the speed exceeds 10km/h and the GPS has a 3dFix. The audio will then be kept active until the B1 NAV is switched off. The default value for the auto silent parameter is "On".



8.5. Screen contrast



The screen contrast may be adjusted to the pilot's needs. Beware of adjusting a very low value, which may cause the display to be totally blank making it difficult to readjust the display since, nothing will be visible. B1 NAV also has backlight, it is useful when the pilot wants to see flight data in low light conditions. Backlight can be turned on/off through the “Backlight” parameter.

8.6. Language/Units

Language: English
Alti.Units: Meters
Roc.Units: m/s
Speed Units: km/h
Coords.: DD°MM,mmm'

The “Language and Units” menu option allows the user to change the B1nav interface language and units. This menu option also allows changing the coordinate format for the GPS data position display.



8.7. Data fields

D.Field 1: VMG
D.Field 2: G.R.Goal
D.Field 3: A.OverGoal
D.Field 4: Cur G.R.
D.Field 5: Dist Toff
D.Field 6: Land In

The User Defined data section fields described in 2.5. of page 12, can be defined here the image below (figure:20) shows the correspondence to the data field number:

VMG	A.OverGoal	Dist Toff
Data field 1	Data field 3	Data field 5
G.R.Goal	Cur G.R.	Land In
Data field 2	Data field 4	Data field 6

User defined fields (figure:20)

8.8. FS Keys

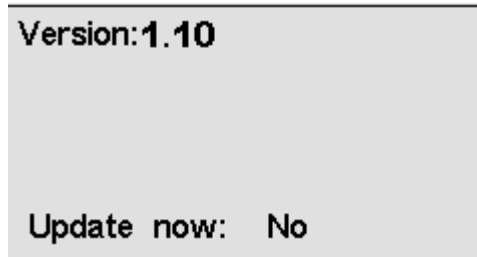
Fn key1: Sound On/Off
Fn key2: Switch page
Fn key3: Mark MOB

In Flight Mode keys S3,S4 and S2 assume functionality that can be defined by the user. The following functions can be allocated to the function keys.

Function	Description
Sound On/Off	Toggles through the various volume settings.
Airfields	Jumps from flight screen directly into Near Airfields screen.
Reset A2	Sets altimeter 2 to zero.
Switch group	Toggles between groups of user defined fields.
Set Altimeter	Sets main altimeter directly in flight screen.



8.9. Firmware



Firmware update setting (figure:21)

The update of the firmware is a simple procedure that adds new features to the B1 NAV firmware.

Before beginning update procedure make sure you download from our site (www.flymaster-avionics.com) the next list of files:

- USB Drivers (FlymasterUSBdrivers.msi)
- The last version of the firmware(B1NavFirmware.b1n)
- The update application(FlashB1navSetup.msi)

When you have all the files you can start the update procedure.

The first step of the updating procedure consists in installing the USB drivers on the PC. In order to do that you should run the FlymasterUSBdrivers.msi file and follow the on-screen instructions.

Next you need to install the update application, run the FlashB1navSetup.msi and follow the on-screen instructions.

Once the driver and the update tool is correctly installed use the following procedure.

1. Connect the B1 NAV to your PC using the cable supplied. If it is the first time the B1nav is being connected to the PC Windows should report that new hardware is present a ready to use.
2. Execute the FlashB1nav (FlashB1NAV.exe) application. You will probably receive a security warning from windows about the application.



FlashB1Nav (figure:22)



-
3. Using the “...” button browse for the B1 NAV firmware previously downloaded from our website.
 4. Click the “Send” button. FlashB1Nav will report “Waiting for B1...”
 5. On B1nav go into the settings menu and choose the Firmware option(Figure 21).
 6. Press S2 key in order to highlight the “No” word corresponding to the “Update Now” parameter.
 7. Use the S3 or S4 key in order to change the “No” to “Yes” and then press the S2 key to confirm the option

If everything is ok then a message in the B1 NAV screen and flashB1 software appears saying that the B1 NAV is updating. You should wait until the process ends and the B1nav starts to function normally.



9. Miscellaneous

9.1. *Fail Safe firmware update*

- **Introduction**

The Fail Safe firmware update is a last resort tool if an unexpected error occurs during the update process. This will leave the B1 NAV with incorrect or incomplete firmware, rendering the use of the settings menu inoperable.

Note: This procedure is a last resort measure, FLYMASTER

- **Update procedure**

To update the B1 NAV you will need to install the B1 NAV's USB driver which is available on our web site, in the section downloads of the B1 NAV.

Follow the same procedure described in section 8.9. to install the drivers, once they are correctly installed use the following procedure.

1. Connect the B1 NAV to your PC using the cable supplied. If it is the first time the B1 NAV is being connected to the PC Windows should report that new hardware is present a ready to use.
2. Execute the FlashB1nav application.
3. Select the B1Firmware.b1n file previously downloaded from the web site.
4. Push the "Send" button.
5. Hold the "Menu" button on your B1, and insert a toothpick into the reset orifice on just above the USB connector on the B1 NAV in such a way as to reset the B1.
6. Release the reset button but **do not release the the "Menu" button**. If the message "Erasing memory..." is shown in FlashB1NAV you may release the "Menu" button, if not press and release the reset button again until the message is shown. Note that the reset button is a small switch inside the B1, you should feel it click.
7. Wait until you see the message "Complete" on the FlashB1nav ,and B1 NAV starts to function normally.

9.2. *How to reset the B1 NAV*

- **Introduction**

The reset procedure allows the pilot in case of the B1 Nav freeze or stop responding, to reboot the device, thus allowing the device to return to work correctly.

Note: The reset procedure will not lost any configurations that the pilot previously saved, the only data that will be lost is the date and time.



- **Reset procedure**

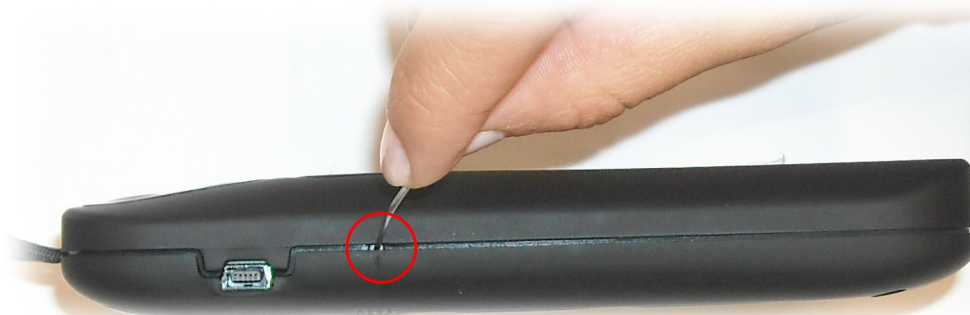
To reset the B1 NAV you need a paper clip, or a small wire.

1. Locate the the reset orifice, it is located just above the USB connector(Figure 23)



Reset orifice(Figure 23)

2. Grab the paper clip(or small wire) and gently insert it on the reset orifice(Figure 24)



Clip insertion(Figure 24)

3. Gently push the reset button until you feel a click.
4. Look at your B1 NAV screen if the procedure is done correctly the B1 NAV will reboot and start working on the flight screen.



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